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MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : MILITARY THOUGHT (USSR): Soviet Assessment of North Vietnamese Air Defense Actions Against US Aircraft

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought." This article describes the operations of North Vietnamese air defense and air forces against US aircraft from 1965 to 1967. The evolution of tactics as the result of interaction of attacking and defending forces is the primary focus of the article. While there is some criticism of North Vietnamese air defense doctrine and tactics, the author expresses admiration for the performance of the defenders against overwhelming odds. This article appeared in Issue No. 2 (81) for 1967.

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies.

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William E. Nelson
Deputy Director for Operations

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MILITARY THOUGHT (USSR): Combat Actions of Air Defense Troops and the Air Forces of the Democratic Republic of Vietnam

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Summary

The following report is a translation from Russian of an article which appeared in Issue No. 2 (81) for 1967 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought." The author of this article is Colonel A. Gryaznov. The study describes the operations of North Vietnamese air defense and air forces against US aircraft from 1965 to 1967. The evolution of tactics as the result of interaction of attacking and defending forces is the primary focus of the article. While there is some criticism of North Vietnamese air defense doctrine and tactics, the author expresses admiration for the performance of the defenders against overwhelming odds. The value of the North Vietnamese experience to Soviet forces is acknowledged. Tables are used to depict the relative effectiveness of the air defenses by weapons systems, density of attack and chronology.

End of Summary

Comment:

Colonel A. Gryaznov wrote an article on vectoring fighter aircraft in Aviation and Cosmonautics for October 1964 and an article on US air operations in Vietnam in Red Star on 16 August 1966. Military Thought has been published by the USSR Ministry of Defense in three versions in the past--TOP SECRET, SECRET, and RESTRICTED. There is no information as to whether or not the TOP SECRET version continues to be published. The SECRET version is published three times annually and is distributed down to the level of division commander.

COMBAT ACTIONS OF AIR DEFENSE TROOPS AND THE AIR FORCES OF THE DEMOCRATIC REPUBLIC OF VIETNAM

by

Colonel A. Gryaznov

A short summary of combat actions for two years. Air defense troops and the air forces of the Democratic Republic of Vietnam (DRV) conduct continual combat with American aviation, which has been carrying out systematic raids, both day and night, against the DRV since 7 February 1965.

To achieve their aggressive goals, in 1966 the Americans increased the intensity of their aircraft raids by a factor of more than one and one-half. If, in 1965 more than thirty thousand aircraft sorties were carried out over the territory of the DRV, then, from 1966 to February 1967, there were more than fifty thousand sorties. Every twenty-four hours an average of up to 160 aircraft sorties, and on some days up to 300, were carried out over the DRV to deliver bombing strikes, to conduct aerial reconnaissance, and to cover strike groups of attack aviation.

The number of aircraft sorties conducted by US aviation over the DRV, by months, is shown in the table. (See Table 1.)

In all, for two years, American aviation carried out over eighty thousand aircraft sorties over the DRV. Included in that total are approximately 9000 bombing strikes against various targets in DRV territory. As a result of these strikes more than 800 installations were completely or partially destroyed. In 1966, the greatest destruction was inflicted against ground and water communications. Up to sixty percent of the tactical and carrier aviation participated in the bombing of bridges and water crossings, stations and railroad stations, and river and

seaports. The US command allocated up to thirty percent of the total number of aircraft for strikes against industrial and power installations, and up to ten percent for the destruction of hydrotechnical installations and military targets. Approximately twenty percent of the aircraft sorties were accomplished under night conditions, both to deliver bombing strikes and also to conduct aerial reconnaissance.

The basic strike force of tactical aviation consisted of the F-105 (sixty percent) and the F-4C (twenty-five percent). Reconnaissance tasks were accomplished by the RB-66 and the RF-101 (fifteen percent). Carrier aviation involved in combat actions were the A-4D and A-4E (fifty-five percent), the F-4H and the F-4B (twenty percent), and the F-8, A-6, RA-5C and RF-8 (twenty-five percent).

There were systematic actions up to fifteen times against the same target with from thirty to fifty aircraft participating in each raid. As the countermeasures by the air defense and air forces of the DRV increased, the USAF and USN commands continuously altered their strike tactics, endeavoring to find new methods and ways to accomplish the basic tasks of destroying the national economy installations of the republic with the least amount of losses in aircraft and pilots.

Even though American aviation inflicted significant damage on the national economy of the DRV, the aggressors still did not achieve their goals. The Vietnamese people in the north and south of the country continue their heroic struggle against American imperialism. The Vietnamese information agency reported that, as of 15 May 1967, 1900 American combat aircraft were destroyed over the DRV solely by the forces and means of the air defense and air forces of the Vietnam People's Army (VPA); thus, appreciable losses in equipment and pilots have been inflicted on the USAF. The number of aircraft downed comprises two percent of the overall total of aircraft sorties carried out by American aviation over the DRV. It should be recalled that American

aircraft losses by the end of World War II comprised only one percent of the overall total of aircraft sorties carried out by their aviation during World War II.

The following unfavorable conditions have substantially affected the results of the combat actions of the DRV air defense:

-- air defense is conducting an unequal struggle against a powerful opponent who has complete air superiority. In the air raids on the DRV, more than 1500 modern jet aircraft are participating from air bases in Thailand and South Vietnam and from aircraft carriers. The number of SAM systems available to the air defense of the DRV is inadequate for the struggle against US aviation, besides which the lower limit of their kill zone is 500 meters;

-- the fighter aviation of the VPA has a limited number of fighter aircraft. The lack of airfields on the coast of the Gulf of Tonkin and on the borders of Laos and South Vietnam does not permit interception of the air enemy on the distant approaches to the principal installations in the country;

-- the mountainous-forested terrain (three-fifths of the territory in the country) gives rise to favorable conditions for the concealed approach of American aircraft to their strike targets along river valleys with exits to key areas of the country and makes it difficult for radiotechnical troops of the VPA to effect the timely detection of piloted and pilotless targets, particularly those flying at low altitudes;

-- the air defense of the VPA began to be established in an organized manner only at the initiation of air raids against the DRV and was improved while already engaged in combat actions. Concomitantly, there were difficulties and great deficiencies (still not overcome at present) in the organization of the air defense in the control of forces and means while repulsing air raids, and in the achievement of coordination of fighter aviation with SAM forces and antiaircraft artillery;

-- the cadres do not yet have adequate technical and combat training, particularly for actions in complex situations, though their morale and combat qualities are high.

All this does not allow the full utilization of the combat capabilities of even the available forces and means of the VPA air defense and air forces.

However, even under these conditions American aviation is suffering heavy losses from the air defense troops of the DRV. The US press reports that air defense means of North Vietnam lately have been downing more American aircraft than are presently being produced in the US. SAM troops, which at present constitute the basis of the air defense of the DRV, have proven to be a formidable force in the struggle against piloted targets. From the date of their employment (24 June 1965) up to 15 May 1967 they have downed 396 American aircraft; on the average three missiles were expended to destroy one target.

Fighter aviation of the VPA air forces, which has modern fighter aircraft in its arsenal, is also conducting a successful struggle against enemy aircraft; in air battles it has destroyed 116 American aircraft while losing 49 fighters.

Antiaircraft artillery and antiaircraft machine guns are the most numerous air defense means that the VPA has. They are credited with seventy-six percent of the American aircraft destroyed. The explanation for this is, first, since the second half of 1965 American aviation has been forced to fly at low altitudes because of the actions of the SAM troops; second, antiaircraft artillery and antiaircraft machine guns operate throughout DRV territory where there are no SAM troops or fighter aviation; and, third, there are incomparably more tube artillery means in the VPA air defense than there are SAM battalions and fighter aircraft.

The results of two years of combat actions by the DRV air defense are shown in the table (SAM troop and fighter aviation data from Soviet military specialists, antiaircraft artillery data from the VPA command). (See Table 2.)

From the table it can be seen that the average number of missiles expended to destroy one target began to rise considerably in 1966. The lowered effectiveness of fire and increased average expenditure of missiles, especially since the second half of 1966, are primarily due to the fact that attacking aviation improved the

methods of overcoming SAM defenses. The US command, on the basis of a detailed analysis of reconnaissance data and the study and exposure of the weak aspects of the SAM systems employed in the DRV, developed for its aviation new tactical approaches to overcome SAM defenses. The basic one was the following evasive action: after detecting a missile launch from an altitude of 1.5 to 2 kilometers, the aircraft dives sharply to an altitude of 400 to 300 meters, changes its flight bearing 90 to 180 degrees, and leaves the kill zone of the missile system. In addition to this, there is widespread use of very intensive combined jamming (active and passive simultaneously), which, as a rule, prevents accurate missile launches. There was also an increase in the number of air strikes with Shrike type guided missiles against SAM battalion launching sites.

A reduction in firing results was also caused by deficiencies in the combat use of SAM troops. Since 1966 Vietnamese crews have been conducting combat firings independently, not having had enough practice with and knowledge of the equipment from the very beginning. There were even cases when missiles were launched without preparing initial data and without checking the technical equipment. Such missile launches were called the accomplishment of a tactical task to scare off American aircraft. The requirements of Firing Regulations were often not fulfilled: in firing against a maneuvering target, instead of a salvo of three missiles, a single missile was launched. When tracking a target manually, laying operators made errors in angle of sight, as a result of which the missiles went far off the target. Operator lack of skill was particularly noticeable when firing under mode N<1 and MV, which led to ground contact by the missile and its detonation. Here is an example. The battalion prepared for fire on a group target descended to an altitude of 600 meters. Firing was conducted under mode N<1. As a result of errors in the angle of sight committed by the operators, the target was not destroyed and one rocket hit the ground and burst.

Late reporting to battalions about the approach of an air enemy, particularly one at low altitudes, leads to the delayed launch of missiles (in pursuit). Thus, out of thirty firings done in pursuit, only six got results.

The unskilful combat control of battalions also adversely affects the effectiveness of SAM firings. Let us go on to the

following example. In November 1966 six battalions directed fire on two pilotless reconnaissance PQM-34A aircraft, expending twelve missiles. Four battalions also launched missiles against a target already downed.

Despite deficiencies in the combat use of SAM troops, the air defense of the DRV, thanks to the systematic assistance provided by the Soviet Union, obtained significant results in the struggle with American aviation.

The development of air defense and air forces tactics in the VPA: The intensive combat actions of American aviation, the constant change in its tactical methods, the use of new methods of neutralizing air defense means, and, also, the strengthening and improvement in air defense, exerted an influence on the change of tactics in the air defense of the DRV as a whole.

From the initial repulse of the first American air raids, the VPA command did not establish the mission of direct cover for important installations in the country. The basic purpose underlying the combat use of air defense troops was to destroy the maximum number of US aircraft and thereby sustain high morale among the Vietnamese people and their army. As a result of this mission, the tactics for using antiaircraft means led to wide-ranging movements of subunits for the purpose of organizing "ambushes" on the probable flight axes (routes) of American aircraft.

In accordance with this, during the first half of 1965, antiaircraft artillery and machine gun units and subunits usually occupied positions in line formation along the favorite flight paths of the targets. After firing on the aircraft, subunits would receive a new task and depart for a different area. Such a "guerrilla" method of combat with the air enemy from "ambushes" with frequent changes of firing positions allowed the downing of US aircraft with a small number of antiaircraft artillery and machine-gun subunits.

Subsequently the enemy changed his tactics. Aircraft began to fly around the "ambushes" and to deliver more effective strikes against exposed installations. This then forced a change in air defense tactics -- a change to an organized all-around defense of

installations with the simultaneous use of "ambushes" along the approaches to important installations. They started to allocate complete antiaircraft artillery units to the "ambushes," deployed six to five kilometers from the installations on the most probable axes of approach by American aircraft.

When SAM subunits first appeared in the air defense of the VPA, they too were committed initially for action from "ambushes." In order to avoid enemy air strikes (American aviation, upon detecting SAM subunits, strove to destroy them by strafing and bombing), SAM battalions changed launching sites after every firing, executing marches of varying distances by their own means.

Moves to new launching sites were executed under night conditions. The total time spent in moving from one site to another over a distance of thirty to forty kilometers was ten to fifteen hours. A battalion would spend 2.5 hours to pack up its equipment and 3 hours to set it up. In addition, approximately 2 to 2.5 hours were devoted to checking and adjusting the equipment.

Moves were also made by radiotechnical troops in order to assure the viability of the radar coverage and equipment. Alternate positions for radar companies were selected at distances up to fifteen to twenty kilometers from the primary ones. The move by radar companies to alternate positions was accomplished during a single night.

With the rise in the number of bombing and strafing strikes against SAM battalion launching sites, especially after American aviation changed over to low altitude actions, three to five small-caliber antiaircraft artillery batteries and three or four antiaircraft machine-gun platoons began to be allocated to each launching site to provide cover. Furthermore, toward the end of 1965, to provide cover for individual installations, antiaircraft artillery and machine-gun units and subunits began to be employed jointly with SAM battalions, thereby significantly enhancing the effectiveness of the defense of installations. But nevertheless the matter of defending SAM systems against air strikes was not fully solved. Therefore, in addition to aggressive defense measures, widespread use was made of camouflage by the subunits themselves utilizing materials available at hand. To this end, the positions

formerly occupied were often converted into dummy positions by setting up dummy launchers and radars and with imitation missile launches (powder charge bursts with an admixture of brick dust).

As a result of the measures taken, combat equipment and personnel were preserved and, furthermore, a considerable number of American aircraft were destroyed, despite the limited number of SAM battalions in the VPA air defense.

Taking into account the experience of combat with US aviation and the recommendations of our military specialists, the VPA command reviewed the movement tactics of the SAM troops. The need for this review became particularly evident because Hanoi, the DRV capital, and Haiphong, the principal seaport, were not, when needed, protected by SAM troops, since the SAM battalions had moved to new launching sites in advance of American air raids on the suburbs of these cities. As a result of the air strikes, supply dumps with large fuel supplies, located in the suburbs, were destroyed.

In light of this, since July 1966 an installation-zonal SAM defense has been established in the area of the Hanoi-Haiphong cities. SAM battalions have formed a solid SAM zone cover for this area. In addition, the defense has been strengthened by a large number of tube antiaircraft means, and all fighter aviation of the VPA air forces has been located within the zone. Thus the bulk of available active air defense means, capable of destroying simultaneously several tens of targets, have been concentrated in the Hanoi-Haiphong area.

Such a defense, as borne out by the results of combat actions has made the penetration of the Hanoi-Haiphong area considerably more difficult for US aviation.

Upon encountering this stronger air defense by the DRV, the enemy immediately began to change his aviation tactical actions. Continuing to fly at low altitudes, US aviation began to employ complex moves against missiles along with intensive active and passive jamming, and increased its strikes against SAM and antiaircraft artillery sites. This, in turn, led to a lower effectiveness of fire by SAM troops in the Hanoi-Haiphong grouping, as can be seen in the following table. (See Table 3.)

From the table it is evident that of 1302 enemy aircraft entering the SAM troop zone, 382 aircraft, constituting approximately thirty percent, were destroyed by all of the active means. On the average, one out of every three US aircraft was destroyed. In all, during these months the US carried out 30946 aircraft sorties over the DRV, losing 494 aircraft from the fire of all active air defense and air force means of the VPA. Such relatively small losses by American aviation are primarily due to the fact that an overwhelming majority of its forces did not enter into the zone of action of the active air defense means. In addition, the above-mentioned deficiencies in the employment of air defense forces and means were operative.

Because of its limited number of aircraft and lack of trained pilots, fighter aviation of the VPA conducted limited combat actions. But since July 1966 its activity has risen significantly. It began to carry out battle with US aviation not only from duty on the ground, but also from duty in the air. During the second half of 1966 it shot down in air combat forty-nine American aircraft, of which there were twenty F-105, eight F-4C, five A-4D, two F-8, two RF-101, one A-6D, one C-47, and three pilotless PQM-34A reconnaissance aircraft. Of this number, eighteen were shot down by MIG-21 fighters and twenty-four by MIG-17 fighters.

Some success was achieved by VPA fighters as a result of the increased skill of Vietnamese pilots in MIG-17 aircraft and the mastering by some of them of the MIG-21 aircraft for day flights in uncomplicated weather conditions.

Vietnamese pilots skilfully employed the high maneuverability capabilities of the fighters, particularly of MIG-17 aircraft, to conduct surprise attacks against the enemy by approaching and closing in on him from the direction of the sun, from behind clouds. Destruction of the enemy was accomplished in close combat by salvo cannon-fire on the first attack. Thus, on 18 August four MIG-17F fighters, after takeoff from their airfield, encountered eight F-105 aircraft. In fast-moving combat at an altitude of 500 meters one F-105D aircraft was shot down. The remaining enemy aircraft, jettisoning their bombs and in disorder, maneuvering between mountain heights, returned to their base.

On 5 September two MIG-17F aircraft were dispatched to an area where US aircraft had appeared. The Vietnamese pilots spotted the enemy aircraft in the designated area. Using cloud cover, they made a concealed approach to the enemy and attacked a pair of F-8 aircraft by surprise from behind and below. The attack was made by delivering salvo cannon fire from a range of 200 meters with individual targetting and resulted in both enemy aircraft being downed.

Air combat carried out with the participation of MIG-21 fighters demonstrated that this aircraft possesses high combat qualities. The Americans acknowledge that the MIG-21 is not inferior in speed to the most modern multipurpose tactical fighter of the US, the F-4C, and exceeds it in maneuverability. A battle which took place on 21 September may serve as confirmation of this. A pair of MIG-21 fighters, on duty in the air, spotted a group of enemy aircraft, consisting of four F-4C and eight F-105D, flying in the Dap Cau bridge area. At the instant when the American aircraft began to execute their maneuver to attack the target, the lead MIG-21 attacked from above and behind the rearmost F-105F aircraft. The aircraft was shot down by a single missile from a range of 1500 meters, air altitude of 1200 meters, and at a speed of 700 kilometers per hour.

However, there were also unsuccessful actions by VPA fighter aircraft. For example, on 14 July 1966 a pair of MIG-21 aircraft were sent up to protect an airfield. Before they could reach an altitude of 200 meters in the airfield area, a group of enemy aircraft appeared. The Vietnamese fighters, upon spotting the enemy, dropped their suspended tanks and began to pursue him. The lead MIG-21 launched two missiles, but, because the enemy aircraft maneuvered violently, the missiles did not hit the target. Following this, the MIG-21 aircraft were attacked by surprise by a group of tactical fighters which were on duty in the air behind the crest of a nearby mountain outside radar visibility. As a result, both MIG-21 aircraft were shot down by air-to-air missiles. The outcome of this battle is to a large degree explainable by the fact that our aircraft were not covered by other fighters and that antiaircraft means were not authorized to deliver fire on the enemy aircraft because their own fighters were in the air.

The effectiveness of the combat actions of VPA fighter aviation was lowered in most instances because there were many grave deficiencies in the combat use of fighter aircraft. The basic ones are as follows:

-- putting the fighters into the air was, as a rule, delayed and done at the time enemy aircraft were already over their targets;

-- cover for the fighter aircraft taking off to intercept the targets was not provided by other aircraft or else was carried out with considerable delay. The actions of fighters were not covered by antiaircraft means because of a lack of coordination between fighter aviation and SAM (antiaircraft artillery) in a single zone;

-- control of fighter aircraft was effected through the use of plotting boards (with a three to six minute delay), or by indicating to them the direction and range to the enemy. Control for the fighters by radar plan position indicators is not considered feasible by the VPA air defense because of the mountainous and forested terrain relief.

In a number of instances VPA fighter aircraft suffered losses because the pairs and flights flew close together. The conditions and nature of air combats convinced the Vietnamese of the need for fighters to have freedom of maneuver in order to conduct successive attacks against American aircraft by individual targetting. Support aircraft in pairs now keep apart at a distance of 600 to 800 meters, and between pairs a distance of 800 to 1200 meters is maintained. Under these conditions loss of visual contact in air combat has been cut down and coordination between pilots within groups has improved.

As a whole, the actions of VPA fighter aviation since the second half of 1966 have been more daring and aggressive, although Vietnamese pilots have been forced to conduct air battles with a numerically superior enemy.

Influence of air defense on the tactics of American aviation. The command of the USAF and USN, taking into account growing losses in aircraft over the territory of the DRV, constantly and

operationally improved the tactical methods of its aviation in order to find ways of decreasing the effectiveness of the VPA air defense, particularly of the SAM battalions.

The solution of the indicated tasks was undertaken simultaneously by the following approaches:

-- by finding flight altitudes, profiles and routes for aircraft which would significantly hamper the combat efforts of all air defense means and lower their effective employment.

-- by strengthening the combat security of the actions of aircraft strike groups by: using decoy groups, increasing fighter cover groups, bypassing SAM troop zones, and conducting radiotechnical reconnaissance over the DRV by special aircraft;

-- by seeking new ways and methods, and perfecting those currently in use, of combatting antiaircraft artillery and SAM;

-- by actively neutralizing air defense means on SAM launching sites and antiaircraft artillery firing positions destroying airfield installations and runways on the airfields where VPA fighter aviation is based, and using intensive jamming against radars of varied frequency ranges.

Let us examine each of these approaches in more detail.

Beginning with 7 February and continuing up to August 1965, while the VPA air defense was still weak and conducted by antiaircraft means, the basic method of combat actions by American aviation was to carry out concentrated strikes by groups (from thirty to sixty aircraft) of tactical fighters and carrier attack aircraft from medium and high altitudes.

In the second half of 1965, SAM battalions began combat actions. Within five months they destroyed ninety-three US aircraft with an average expenditure of 1.3 missiles per aircraft downed. Such high results by SAM troops forced American aviation to change its tactics abruptly. It gave up actions from advantageous altitudes and changed to echeloned actions by small groups at low (150 to 300 meters) and even very low altitudes

(hedge-hopping) in order to achieve greater surprise in their strikes, to disperse the strength of the air defense means, and, in the end, to decrease their aircraft combat losses.

The lower flight altitudes of American aircraft led to a change in the method of attacking DRV installations. If bombing and air-to-surface missile launches were formerly carried out, in a number of instances, by diving at angles of fifty to sixty degrees and gliding at angles of twenty to thirty degrees then for actions from low altitudes bombing was carried out primarily from horizontal flight. The means of destruction most widely used were small bombs, free rockets, and cannon fire.

The changeover by US aviation to actions primarily at low altitudes limited the possibility of using SAM systems and fighter aircraft to combat them, but, at the same time, this created favorable conditions for using small-caliber antiaircraft artillery and antiaircraft machine guns.

At this time, the Americans began to undertake measures to neutralize SAM troops by bombing and strafing attacks. Up to the end of 1966 more than eighty strikes had been delivered against SAM battalion sites, using Shrike and Bullpup guided missiles, free rockets, aerial bombs, and cannon fire. Battalion sites were hit by small groups of aircraft employing various methods of attack. However, the results of strikes against launching sites were, as a rule, of limited effectiveness.

From 1966, when the number of SAM troops in the DRV air defense increased, the Americans, from January to the end of April, have made wide use of pilotless reconnaissance aircraft. Reconnaissance was conducted at altitudes of seventeen to twenty kilometers by PQM-34A reconnaissance aircraft, and at altitudes of 500 to 800 meters, by 147j aircraft. This was done for two reasons: first, a pilotless reconnaissance aircraft has a reflective surface of less than one square meter, and it may be launched from the ground or from a mother aircraft. Therefore it is more difficult to detect and destroy by air defense means;

second, the loss of a pilotless reconnaissance aircraft costs the Americans much less than the loss of a piloted aircraft. Combat with pilotless reconnaissance aircraft by SAM troops has required a higher degree of training for missile guidance station operators.

In conjunction with the increased number of missile battalions in the DRV, US aircraft losses to mid-1966 had significantly risen, as has already been mentioned. Thereupon, the Americans sharply decreased the number of aircraft in groups participating in raids on installations. If formerly a strike group was composed of eight to sixteen aircraft, now there are no more than two to four. At the same time, there was a significant increase in the number of active and passive jamming aircraft and in the number of reconnaissance aircraft.

Simultaneously with the reduction in the makeup of strike groups, US aircraft began to bypass the kill zones of SAM troops more frequently. In certain months thirty to fifty percent of the aircraft did not enter SAM battalion zones. However, by May 1966, the number of SAM battalions in the Hanoi-Haiphong area had risen so much that US aircraft, charged with the mission of delivering strikes against installations in the middle of the country, could no longer avoid their kill zones. American pilots then began to make complex moves to avoid missiles. A pilot would direct his aircraft at an altitude of 1.5 to 2 kilometers to a strike target located in the SAM troop zone. He knew that he would be informed at any moment of the launch of the first SAM by radio from observation aircraft located outside the SAM troop kill zone, or he would see a light or some other signal on his panel. Upon receiving the signal of missile launch or that the SAM command radio transmitter had begun operating, the pilot would immediately put the aircraft into a dive and drop sharply to an altitude of 400 to 300 meters with a simultaneous flight-bearing change of ninety degrees or more. As a result of this, the effectiveness of fire by missile battalions was noticeably lowered.

With the creation of installation-zonal defense in the Hanoi-Haiphong area, penetration of air defense became even more difficult for US aviation, particularly after the introduction of fighter aircraft. Actions by VPA fighter aviation forced the Americans

to undertake a number of defensive measures. For observation of the air space over the DRV, radar observation was organized with the aid of radiotechnical means located on board the EC-121K aircraft. These aircraft had the task of detecting VPA aircraft in the air and of reporting them to their own aircraft; to accomplish this they flew along the Gulf of Tonkin coast. Of the strike groups which were to carry out the launching strikes, up to one-third of their composition was air cover aircraft organized for "ambushes" to take place from behind clouds or mountain crests. Also, the time spent by aircraft in the kill zone of active air defense means was shortened to a single bombing run. Flights to the targets were carried out in varying profiles, and upon approaching the SAM troop kill zone the groups would break up into pairs and deliver their strikes from various directions.

The strengthened countermeasures of the VPA fighter aviation significantly hampered, in a number of instances, raids by American aviation and paralyzed its actions. In the absence of reliable cover, the appearance of VPA fighters would often frustrate the accomplishment of tasks; American pilots would be forced to jettison their bombs ahead of time to lighten the aircraft before repulsing the attack of Vietnamese fighters.

To eliminate the threat which had arisen, the Americans decided in January 1967 to destroy VPA fighter aviation in the air. To this end, special operations were carried out. On 2 January 1967, for example, the Americans employed for this purpose more than eighty aircraft, including up to fifty F-4C, approximately twenty-four F-105, and a group of F-104. According to the operational concept, F-105 aircraft were to deliver strikes against previously selected targets. F-4C aircraft, comprising fourteen groups (three to four aircraft in each), without bombs or suspended tanks, but with a full load of guided missiles, proceeded simultaneously with the F-105 aircraft in combat formations for attacking ground targets. For complete security the F-105 and F-4C combat formations were covered by F-104 aircraft. At the last moment the F-4C aircraft broke away from the F-105 aircraft and adopted the necessary combat formation to attack the VPA fighter aircraft.

The command of the VPA air defense and air forces did not guess the enemy concept; furthermore, their fighter aircraft were put up into the air when the enemy aircraft were already over the airfield behind clouds at an altitude of 3000 to 5000 meters. When the first flight of MIG-21 aircraft came out of the clouds, still in the rendezvous stage, each aircraft was attacked by six to eight enemy missiles. The surprise attack resulted in the downing of all four MIG-21 fighters. Within ten minutes the second flight of MIG-21 aircraft was attacked in a similar fashion upon coming out of the clouds, and the flight commander's aircraft was shot down. The remaining pilots, having lost control, engaged in combat independently and shot down two F-4C aircraft. During this time, below the clouds at an altitude of 1500 meters, twenty-two MIG-17 aircraft were on duty in the air with the task of keeping US aircraft from striking the airfield from low altitudes; they did not participate in the air combat which took place.

On 6 January two MIG-21 aircraft were downed in a similar manner. VPA fighters were put into the air as formerly, when American aircraft were already over the airfield. Thus, by establishing numerical superiority in the air, American aircraft twice attempted to destroy the VPA fighter aircraft in the air. However, they did not succeed in accomplishing this task, although in two battles they downed seven MIG-21 aircraft.

The aggressive and successful combat actions of the DRV air defense in repelling small groups of enemy aircraft again forced the Americans to change the tactical actions of their aircraft. In December 1966 the American command carried out four massive raids on DRV installations in the Hanoi area; each raid was carried out by 120 to 140 tactical fighters and carrier attack aircraft (in approximately equal numbers). The raids were organized identically. Tactical fighters carried out their raid from the direction of Laos and the carrier attack aircraft from the direction of the Gulf of Tonkin (from the southeast). The aircraft came from each direction in large groups at an altitude of 6000 meters at ten to fifteen minute intervals. Then the groups broke up into four to eight aircraft each and dropped to

an altitude of 1500 meters. Immediately before the strike target the aircraft broke up into smaller groups (of two aircraft each) and delivered their strike from various directions and from chandelles with successive dives from an altitude of 1200 to 1000 meters. Upon approaching the SAM troop zone, the follower and leader in each pair successively switched on the afterburners and kept overtaking each other, thereby creating "scissors," as it were, on the radar display screens and hampering target tracking. The aircraft penetrated the SAM troop zone from three or four directions simultaneously with two or three groups from each direction and echeloned by altitude.

In general, each raid lasted forty to sixty minutes. Up to thirty percent of the aircraft delivered strikes against installations with aerial bombs and guided missiles. The remaining aircraft were used to make up diversionary groups (aircraft of various types), cover groups (F-4 and F-8), jamming groups (RB-66 and F-105), groups to neutralize air defense means, and reconnaissance groups. Those which did the jamming operated 80 to 120 kilometers from the strike targets outside the SAM troop zone. RF-101 reconnaissance aircraft conducted reconnaissance before and during the strike and after the raid. Pilotless PQM-34A reconnaissance aircraft conducted reconnaissance after the end of the raid from an altitude of seventeen to eighteen kilometers and the 147j aircraft from an altitude of 400 to 800 meters.

During two years of struggle by the forces and means of the VPA air defense and air forces with American aviation, a large and varied experience has been accumulated, which also has great importance for our own air defense troops. The necessity for studying and for the practical application of this experience in the daily training of our air defense troops is dictated by the fact that considerable areas of our country, with high population density and developed industry, may be within range of the tactical and carrier aviation of the probable enemy; and the enemy measures and tactical approaches to the use of his means for air attacks may be analogous to those used in the DRV.

Of course, the adoption and dissemination of the combat experience presented above must be amended to take into account the specific conditions under which the air defense and air forces of the Democratic Republic of Vietnam have to operate.

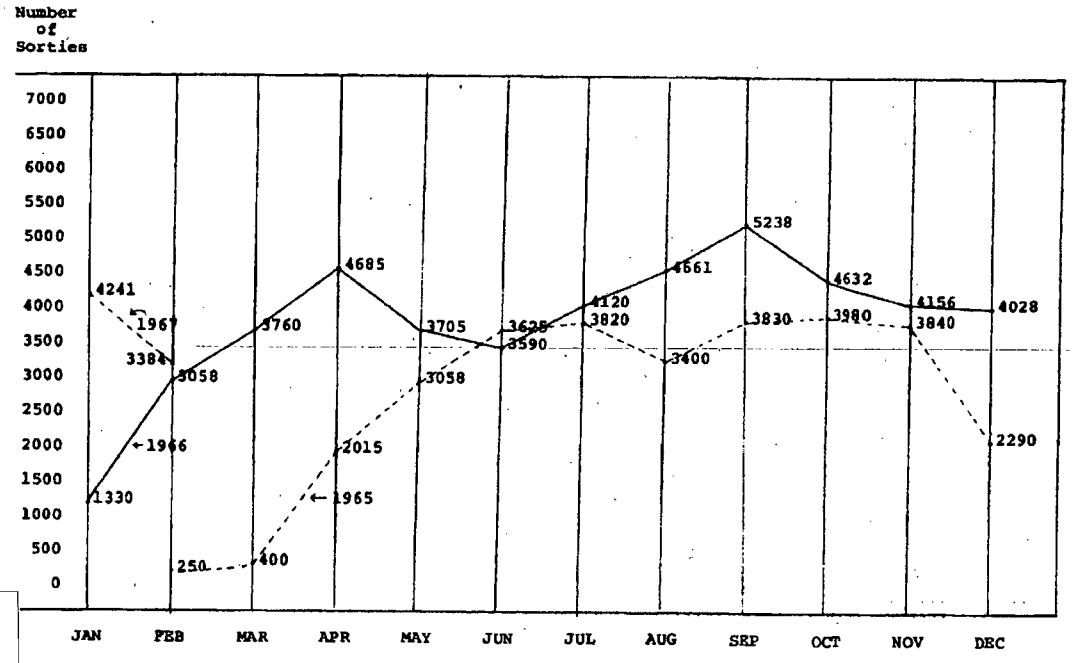
Number of Sorties
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
4241
1967
3384
3058
1330
1966
250
400
3760
4685
2015
1965
3705
3058
3625
3590
4120
3820
4661
3400
5238
3830
4632
3980
4156
3840
4028
2290

Table 1

Years	Number of US Aircraft Destroyed	Including						
		SAM Troops			Fighter Aviation		AAA and AAMG	
		Downed	Average of Missiles Expended	%	Downed	%	Downed	%
1965	850 (273)	93 (11)	1.3	10.9	18 (4)	2.1	739	86.9
1966	756 (465)	203 (24)	3.14	27	56 (12)	7	497	66
1967 (up to 15 May)	291	101	4.8	36	42	14	148	50
Total	1897	396 *	3.1	20	116	7	1385*	73

* Arithmetical errors

Table 2

By Month	Targets Entering SAM Troop Zone		Targets Fired at by SAM Troops		US Aircraft Destroyed				
	Groups	Aircraft	Groups	Aircraft	SAM Troops	AAA	Fighter Aircraft	Total	Percent
1966									
July	52	186	52	--	41	32	11	84	45
August	67	223	67	--	35	33	5	73	33
September	31	103	31	--	20	33	8	61	60
October	68	168	6	16	8	20	5	33	19
November	64	128	46	91	14	7	1	22	17
December	150	377			20	26	19	65	17
1967									
January	51	117	51	117	17	24	3	44	35
Totals	483	1302	--	--	155	175	52	382	30 approx.

Table 3